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10/790,213	03/02/2004	Seiichiro Tabata	402993	1012

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EXAMINER	
LIU, LI	

ART UNIT	PAPER NUMBER
2613	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/790,213	TABATA, SEIICHIRO	
	Examiner	Art Unit	
	Li Liu	2613	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 March 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7,13,14,16 and 17* is/are rejected.

7)☒ Claim(s) *8-12,15 and 18* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *02 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *03/02/2004* 2/16/06
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Information Disclosure Statement

1. The information disclosure statements (IDS) submitted on 03/02/2004 and 02/16/2006 are being considered by the examiner.

Preliminary Amendment

2. The preliminary amendment filed on 03/02/2004 has been entered.

Specification

3. The disclosure is objected to because of the following informalities:

1). Page 9, line 2, the "DOE lens 4" should be changed to "DOE lens 5".

2). Page 29 line 22, the "DOE mirrors 1 and 22" should be changed to "DOE mirrors 21 and 22".

Appropriate correction is required.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1, 2, 4-7,14 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohnishi et al (US 5,555,334) in view of Gal et al (US 5,600,486) and

Freeman et al (Freeman et al: "High Efficiency HOEs for Holographic DVD Pickup Heads", IEEE Transactions on Maganetics, Vol. 34, NO. 2, March 1998, page 456-458).

1). With regard to claim 1, Ohnishi et al discloses an optical transmission module (Figure 1) which sends and receives light transmitted bi-directionally through an optical fiber, said optical transmission module comprising:

a light source (1 in Figure 1) which radiates light of a first wavelength (e.g, 1.3 μm);

a light-detecting section (7 in Figure 1) which detects light of a second wavelength (e.g., 1.55 μm) emitted from said optical fiber; and

a diffractive optical element (6 in Figure 1, and Figure 3), which has principal diffractive action of different diffraction orders respectively for the light of the first wavelength and the light of the second wavelength (Figures 3, 8 and 9), wherein

said diffractive optical element separates a first optical axis passing from said light source to the optical fiber and a second optical axis passing from said light-detecting section to the optical fiber (Figure 1, because of the diffraction element 6, the optical axis from the fiber 5 to receiving device 7 is separated from the optical axis from light source 1 to fiber 5).

But, Ohnishi et al does not expressly disclose a binary diffractive optical element (DOE) with a **staircase-shaped** diffractive surface.

However, the binary DOE with a staircase-shaped diffractive surface has been widely used as beam splitter, coupler and beam shapers in optical interconnection systems, as well as in scanning system. The binary DOE with a staircase-shaped

diffractive surface has a high diffraction efficiency obtained as hologram pattern, and can perform some function that cannot be realized by bulk refractive elements. The binary DOE is relatively easy to manufacture, and present substantial cost savings over conventional precision glass or plastic optical lenses.

Gal et al discloses the advantages of the binary DOE (Figure 3) and uses the binary DOE as the color separator (Figure 2). And Freeman et al also uses the binary DOE (Figure 2, Multilevel blazed hologram) to diffract the input light to the photodiode so to integrate the laser diode and photodiode in a small compact module (Figure 1).

Because of the advantages of the binary DOE, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the binary DOE as used by Gal et al and Freeman et al to the system of Ohnishi et al so that the system cost can be reduced and the diffraction efficiency can be increased.

2). With regard to claim 2, Ohnishi et al in view of Gal et al and Freeman et al discloses all of the subject matter as applied to claim 1 above. And Ohnishi et al in view of Gal et al and Freeman et al further discloses wherein the diffractive optical element bends one of the light of the first wavelength and the light of the second wavelength by diffraction (Figure 1, the wavelength 1.55 μm is bent), and does not bend light not bent by zero order diffraction (Figure 1, the wavelength 1.3 μm is not bent).

3). With regard to claim 4, Ohnishi et al in view of Gal et al and Freeman et al discloses all of the subject matter as applied to claim 1 above. And Ohnishi et al in view of Gal et al and Freeman et al further discloses wherein said diffractive optical element converges one of the light of the first wavelength from said light source onto the optical

fiber, and the light of the second wavelength from the optical fiber onto said light-detecting section (the wavelength 1.55 μm is converged to receiving device 7, and the wavelength 1.3 μm is converged to fiber end 5), and the light converged has a center that is eccentric from one of a straight line passing from said light source to the optical fiber, and from a straight line passing from the optical fiber to said light-detecting section (the light converged to receiving device has a center that is eccentric from the line passing from light source 1 to the optical fiber 5).

4). With regard to claim 5, Ohnishi et al in view of Gal et al and Freeman et al discloses all of the subject matter as applied to claim 1 above. And Ohnishi et al in view of Gal et al and Freeman et al further discloses: the optical transmission module, further comprising a lens (lens 3 in Figure 1) which converges and bends light from said light source toward the optical fiber and converges and bends light from the optical fiber toward said light-detecting section,

But Gal et al does not disclose wherein said diffractive optical element has a grating shape uniform in one direction on an incidence surface on which light from said light source is incident.

However, Gal et al discloses a diffractive optical element has a grating shape uniform in one direction on an incidence surface on which light from said light source is incident (52 in Figure 11).

Because of the advantages of the binary DOE, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the binary

DOE as used by Gal et al to the system of Ohnishi et al so that the system cost can be reduced and the diffraction efficiency can be increased.

5). With regard to claim 6, Ohnishi et al in view of Gal et al and Freeman et al discloses all of the subject matter as applied to claim 1 above. And Ohnishi et al in view of Gal et al and Freeman et al further discloses wherein said diffractive optical element is a transmission diffractive optical element (the diffractive element in Ohnishi et al and the binary DOE in Gal et al are the transmission diffractive optical element).

6). With regard to claim 7, Ohnishi et al in view of Gal et al and Freeman et al discloses all of the subject matter as applied to claim 1 above. But Ohnishi et al in view of Gal et al and Freeman et al does not disclose wherein said diffractive optical element is a reflection diffractive optical element.

However, such limitation are merely a matter of design choice and would have been obvious in the system of Ohnishi et al in view of Gal et al and Freeman et al. Based on the diffraction theory, the transmission grating and reflection grating function exactly the same as long as the shape of the curve, groove and the number of step are the same. If the space in the transceiver module is large enough, a reflection grating may be used. Therefore to use a transmission DOE or a reflection DOE would have been a matter of obvious design choice to one of ordinary skill in the art.

7). With regard to claim 14, Ohnishi et al in view of Gal et al and Freeman et al discloses all of the subject matter as applied to claims 1 and 5 above. But Ohnishi et al does not disclose wherein said diffractive optical element is disposed on a surface of said lens.

However, Gal et al discloses a diffractive optical element is disposed on a surface of a lens (Figure 2, column 6 line 65 to column 7 line 3).

Because of the advantages of the binary DOE, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the binary DOE disposed on a lens as taught by Gal et al to the system of Ohnishi et al so that the system cost can be reduced and the diffraction efficiency can be increased.

8). With regard to claim 16, Ohnishi et al in view of Gal et al and Freeman et al discloses all of the subject matter as applied to claim 1 above. And Ohnishi et al in view of Gal et al and Freeman et al further discloses wherein said light source and said light-detecting section are arranged on a single substrate (11 in Figure 1, column 5 line 58-62), said substrate and said diffractive optical element being housed in a single sealed package (12 in Figure 1, column 5, line 62-66).

6. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ohnishi et al (US 5,555,334) and Gal et al (US 5,600,486) and Freeman (Freeman et al: "High Efficiency HOEs for Holographic DVD Pickup Heads", IEEE Transactions on Maganetics, Vol. 34, NO. 2, March 1998, page 456-458) as applied to claim 1 above, and in further view of Rauch (US 5,537,252).

Ohnishi et al in view of Gal et al and Freeman et al discloses all of the subject matter as applied to claims 1 above. But Ohnishi et al does not disclose wherein said diffractive optical element diffracts the light of the first wavelength and the light of the second wavelength with diffraction orders of mutually opposite signs, so that the light of

the first wavelength and the light of the second wavelength are bent toward mutually opposite directions.

Gal et al discloses that three wavelengths (λ_1, λ_2, λ_3) can be put into –1 order, 0 order and +1 order, respectively (Figures 4 and 5). That is, the λ_1 and λ_3 are bent toward mutually opposite directions. Furthermore, Rauch discloses a binary DOE that can be made to diffract light into –1 and +1 order, and suppress the zero-order. Rauch also states that the blaze pattern can be designed to get other splitting ratio etc (column 5 line 22-26). Therefore, it would be obvious to one of ordinary skill in the art to combine Rauch's special design of the DOE to Gal et al's color separator so that the the suitable designed DOE will diffract two wavelengths to the first order (-1 and +1 order), that is, to bend the two wavelengths in mutually opposite directions.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply a specially designed DOE as taught by Rauch to the system of Ohnishi et al and Gal et al so that more freedom of the arrangement of the components can be obtained.

7. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ohnishi et al (US 5,555,334) and Gal et al (US 5,600,486) and Freeman (Freeman et al: "High Efficiency HOEs for Holographic DVD Pickup Heads", IEEE Transactions on Maganetics, Vol. 34, NO. 2, March 1998, page 456-458) as applied to claim 1 and 6 above, and in further view of Nakanishi et al (US 7,020,366).

Ohnishi et al in view of Gal et al and Freeman et al discloses all of the subject matter as applied to claims 1 and 6 above. But Ohnishi et al in view of Gal et al and

Freeman et al does not disclose wherein said transmission optical element is inclined from an axis perpendicular to the axis connecting said light source and said light-receiving section, on a plane on which said light source and said light-detecting section.

However, Nakanishi et al, in the same field of endeavor, discloses the grating is inclined relative to the optical axis of the light propagating so to reduce the return of the reflected light from the grating to the light emitting device (Figure 8, column 11, line 4-9).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the tilted binary DOE as taught by Nakanishi et al to the system of Ohnishi et al so that the influence from the light reflected from the DOE can be reduced, and the light source can be operated more stably and the noise to photodiode can be reduced also.

8. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ohnishi et al (US 5,555,334) and Gal et al (US 5,600,486) and Freeman (Freeman et al: "High Efficiency HOEs for Holographic DVD Pickup Heads", IEEE Transactions on Maganetics, Vol. 34, NO. 2, March 1998, page 456-458) as applied to claim 1 and 16 above, and in further view of Hirai (US 4,291,330).

Ohnishi et al in view of Gal et al and Freeman et al discloses all of the subject matter as applied to claims 1 and 16 above. But Ohnishi et al in view of Gal et al and Freeman et al does not disclose wherein an electrical signal sent to said light source and an electrical signal received from said light-detecting section cancel each other, so that mutual electrical cross talk is eliminated.

However, the method of canceling of an electrical cross-talk is well known and widely used in the signal processing, Hirai discloses a circuit to eliminate a noise signal and to cancel a cross-talk signal (column 1, line 7-12, Figures 2 and 6).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the similar method of canceling of an electrical cross-talk taught by Hirai to the system of Ohnishi et al so that the interference due to electrical leaking from the nearby component can be eliminated.

Allowable Subject Matter

9. Claims 8-12, 15 and 18 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Katayama (US 5,696,750) discloses an optical head device with a binary diffractive optical element.

Kim et al (US 6,337,841) discloses a compatible optical pickup using binary staircase diffractive element.

Yagi et al (US 2002/0131175) discloses a diffractive type optical pickup lens.

Yamagata et al (US 6,504,975) discloses a coupling lens and semiconductor laser module.

Grossinger et al (US 5,227,915) discloses a binary DOE.

Dammann (Dammann: "Color Separation Grating", Applied Optics, August 1978, Vol. 17, No.15, page 2273- 2279).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Li Liu whose telephone number is (571)270-1084. The examiner can normally be reached on Mon-Fri, 8:00 am - 5:30 pm, alternating Fri off.

11. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ken Vanderpuye can be reached on (571)272-3078. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Li Liu
November 16, 2006

KENNETH VANDERPUYE
SUPERVISORY PATENT EXAMINER